Sampling and Analysis Plan In Support of Bioavailability Study, Midland Area Soils

Prepared for

The Dow Chemical Company

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Contents

Tables (located at the end of each section, following text)

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Abbreviations and Acronyms

µm	micrometer
BC	black carbon content
BSAP	Midland Representative Soils Sampling and Analysis Plan in Support of Bioavailability
C/O	carbon/oxygen
dioxin	polychlorinated dibenzo-p-dioxin
Dow	The Dow Chemical Company
furan	polychlorinated dibenzo-p-furans
H/C/N	hydrogen/carbon/nitrogen
HOC	hydrophobic organic chemical
IDW	investigation-derived waste
ISAP	Independent Science Advisory Panel
K_{ow}	lipophicity
MDEQ	Michigan Department of Environmental Quality
MS	matrix spike
MSD	matrix spike duplicate
PCB	polychlorinated biphenyl
PCOI	potential constituent of interest
ppt	parts per trillion
QAPP	quality assurance project plan
QC	quality control
SAP	sampling and analysis plan
SOC	soil organic carbon content
SOM	soil organic matter
SOP	standard operating procedure
SSCC	site-specific cleanup criterion
SVOC	semivolatile organic compound
TEQ	toxic equivalent, used to report the *toxicity-weighted masses* of mixtures of furans and dioxins
TIC	tentatively identified compound
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

SECTION 1

Introduction

This sampling and analysis plan (SAP) describes the sampling approach and procedures for characterizing the distributions of physical and chemical parameters in surface soil in the vicinity of The Dow Chemical Company (Dow) Plant in Midland, Michigan. The objectives of the sampling program are as follows:

- Characterize the distribution of physical and chemical parameters that are reported to influence bioavailability to identify the range of soils to be used for future bioavailability studies.
- Develop additional information on the nature and extent of polychlorinated dibenzo-p-dioxins (dioxin) and polychlorinated dibenzo-p-furans (furan) in Midland area surface soil.
- Determine whether additional Dow-related hazardous substances are present in Midland area surface soil.
- Develop and implement a process so chemical results for samples obtained on residential properties remain confidential until site-specific cleanup criteria are developed.

The sampling approach presented in this SAP is based on modifications to the *Midland Representative Soils Sampling Analysis Plan in Support of Bioavailability Study* (BSAP) (CH2M HILL, 2006) resulting from comments received from the Michigan Department of Environmental Quality (MDEQ) and the United States Environmental Protection Agency (USEPA). The approach described herein reflects collaboration between Dow, MDEQ, and USEPA to reach a consensus approach that meets the stated objectives. The sampling approach was agreed to during a series of phone conversations and key meetings held on April 20 and May 9, 2006. Subsequent modifications were made to this plan based on comments received from MDEQ June 20, July 3, and July 14, 2006.

1.1 Study Location

The area covered by this study is a portion of the city of Midland and the surrounding community that may have been impacted by offsite releases of hazardous substances from the Dow Plant. The study area encompasses residential, commercial, and industrial properties surrounding the Dow Plant, as shown in Figure 1-1.

1.2 Sampling and Analysis Plan Organization

This SAP is organized as follows:

- **Section 1** presents an introduction to the Midland study area and identifies the project objectives.

- **Section 2** presents the investigation approach and sampling design, describes the sample collection methods, and presents the procedures to be used in assuring confidentiality of sampling locations and sample results.
- **Section 3** describes the methods to be used in evaluating the data collected during this investigation.
- **Section 4** summarizes the data validation and management procedures.
- **Section 5** provides a schedule for the work described in this SAP.
- **Section 6** lists references cited in this SAP.

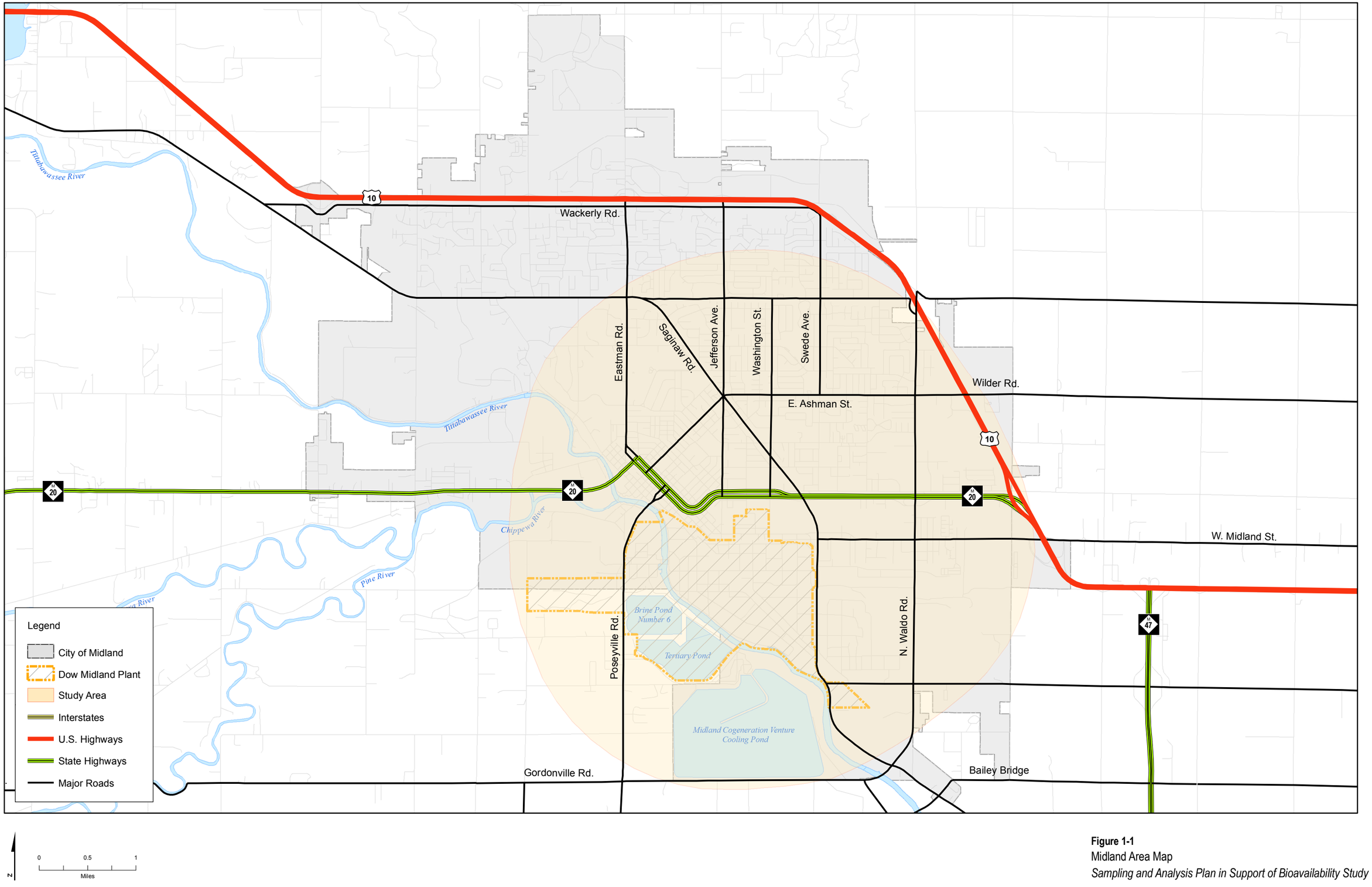

Figure 1-1
Midland Area Map
Sampling and Analysis Plan in Support of Bioavailability Study

SECTION 2

Sampling Design

The investigation approach for the soil sampling program is based on the conceptual site model for release, aerial transport, and deposition of potential hazardous constituents from the Dow Plant as presented in the *Midland Area Soils Remedial Investigation Work Plan* (CH2M HILL, 2005a). This conceptual model considers potential releases from a variety of potential point and nonpoint sources located on the Dow Plant such as emissions from waste incinerators, power plants, production facilities, and fugitive dust.

2.1 Sampling Design

The basic sampling design approach consists of samples collected along radial transects extending from the Dow Plant site into the surrounding community. This design was developed primarily based on the conceptual site model of aerial dispersion and providing additional information about the distribution of hazardous substances in the study area. In addition, the design will provide representative information on soil characteristics in support of a future bioavailability study as well as providing information on the possible presence of hazardous substances other than dioxins and furans.

The basic elements of the design are as follows:

- **Origin of Transects**: Potential major point and nonpoint sources (for example, incinerator complex, power plants, brine electrolysis, and track-out) were considered to create a centralized origin for transects within the Dow Plant. The origin location was established by MDEQ.
- **Number of Transects**: The number of transects was established by MDEQ considering coverage requirements and MDEQ statistical sampling guidance (MDEQ, 2002), meteorological data, and land use patterns in the study area resulting in a total of 23 radial transects. Transects are arrayed such that soil in the dominant downwind directions are sampled more densely than soil in the upwind direction. Wind rose data from meteorological station No. 72639 were used to identify the prevailing wind directions, with the goal of concentrating sampling in directions that are downwind 75 percent of the time. This resulted in 17 transects located in the downwind direction and six transects located upwind, as shown in Figure 2-1.
- **Length of Transects**: The transects extend a minimum of 9,400 feet outward from the origin with a minimum distance of 3,000 feet beyond the Dow Plant boundary into the surrounding community. To assure sufficient lateral coverage into residential areas (needed to support the bioavailability study), every other transect in the dominant wind direction extends approximately 10,000 to 11,000 feet beyond the Dow Plant boundary.
- **Sample Stations along Transects**: Soil samples will be collected within defined sample stations (sometimes referred to as sample "boxes") at regularly spaced intervals of approximately 950 feet along each transect, beginning just beyond the Dow Plant

boundary and extending to the end of the transect. The designated distance between sample stations was determined by MDEQ.

- **Sample Stations**: Sample stations consist of a nominal 300-foot by 300-foot box. The sizes and dimension of the boxes were modified in collaboration between Dow and MDEQ ensure that the study objectives were met. (Adjustments are described in the following section.)
- **Selection of Samples for Analysis**: Where multiple properties are present, samples will be collected from five different properties with one sample selected for laboratory analysis. Selection of the sample for analysis will be subject to a procedure that will ensure the anonymity of the sample selected. This procedure is described in Section 2.4. Where only a single property (or property owner) is present within a sample station, only one sample will be collected and submitted for laboratory analysis.
- **Samples to Evaluate Variability**: The representativeness of the single sample location per box approach will be evaluated using collocated samples obtained at random locations within 10 percent of the sample stations.
- **Sample Depth**: Two sample intervals may be collected at each sample location (a sample location is defined as the specific physical location where a soil sample is collected): one representing the upper 1-inch of soil, and the other representing soil between 1 and 6 inches below grade. The sample intervals obtained at each sample location will be determined by the type of analytical data to be gathered at that location, as described in Section 2.3.

The sampling approach listed above was used to develop the final locations and dimensions of each of the sample stations. Adjustments to the sample stations were necessary to account for actual conditions in the study area. MDEQ and Dow met on May 9, 2006, and reached an agreement on the locations and sizes of each of the sample stations based on the following adjustments:

- Sample stations were adjusted to group together properties of similar land use.
- Sample stations were adjusted to assure the inclusion of multiple properties within the sample station to help protect the anonymity of the property owners. Where possible, a minimum of nine properties were grouped within a sample station.
- In cases where only one or two property parcels were present in proximity to the sample station, the station was adjusted to be fully on one of the properties. Preference was given to Dow or public property to help facilitate access for sampling.
- Sample stations were eliminated in cases where the locations were fully within developed industrial and or commercial property and no viable soils were available for sampling.
- Sample stations were eliminated from the Tittabawassee River floodplain.
- Sample stations were eliminated from Midland Cogeneration Venture cooling water ponds because sediment samples are not representative of soil conditions in the community and any potential hazardous substances that might be present are subject to

different fate and transport mechanisms than surface soils which are the focus of this study.

In addition, modifications to sample stations on Transects R, S, and T were made based on MDEQ comments received on July 14, 2006, in order to ensure a sufficient number of parcels were available in each sample station. After making these adjustments, a total of 145 sampling stations were defined and are shown on Figure 2-2. A list of the parcels within each sample station is provided in Table 2-1.

2.2 Target Analytes

The target analytes for this investigation include bioavailability parameters, dioxins and furans, and additional hazardous substances (chemicals) that may be considered as potential constituents of interest (PCOIs) in future remedial investigation activities. The chemicals and parameters selected for analysis are based on the sample station's position relative to the Dow Plant and the station's dominant land use, as listed below:

- Bioavailability parameter analysis will be conducted on the 0- to 1-inch-interval samples taken at all stations except for those that consist of fully developed industrial or commercial properties because the surface soils in these areas are highly disturbed or not present. All sample stations were agreed to by MDEQ and Dow on May 9, 2006.
- Additional chemical analyses will be conducted on the 0- to 1-inch and 1- to 6-inch-interval samples for the sample locations selected at sampling stations in close proximity to the Dow Plant (the first two sampling stations along each transect closest to the plant).
- Dioxin and furan analysis will be conducted on the 0- to 1-inch-interval samples selected for analysis from all sampling stations, and on the 1- to 6-inch-interval samples taken at sampling stations in close proximity to the Dow Plant.

The target analyte groups for each sample station is listed by transect letter and sample station number on Table 2-1. The individual compounds and analyses associated with each target analyte group are described in the subsections below.

2.2.1 Bioavailability Parameters

Studies to date have shown that the bioavailability of hydrophobic organic chemicals such as dioxins and furans in soil is highly variable, depending not only on a chemical's lipophilicity (K_{ow}), but also molecular steric conformation and soil characteristics. The following primary soil parameters have been reported to influence the bioacessibility/bioavailability of dioxin and furans (Qiu and Davis, 2004):

- **Soil organic matter (SOM):** SOM has a strong affinity for most organic compounds and may exist in "rubbery" and "glassy" phases. SOM retards sorption and desorption by its viscosity and by the presence of internal nanopores, which detain molecules and may sterically inhibit their migration and thus limit their bioavailability (Pignatello, 2000). The inherent heterogeneity of SOM results in a wide range of sorption capacity for hydrophobic organic chemicals (HOCs) and nonlinear partitioning behavior in soils and

sediments (Gustafsson et al., 1997). Subdomains of SOM include soil organic carbon and black carbon.

- **Soil organic carbon (SOC):** SOC is a subdomain of SOM and is a measure of the sorption capacity of a soil for HOCs.
- **Specific surface area:** Surface area has been reported to be a significant factor affecting the bioavailability of dioxins and furans. A large surface area and high aromaticity enables the formation of π-π interactions (Lyytikäinen et al., 2003). These factors favor stronger binding to soil and sediment, thus decreasing desorption and bioavailability of the chemical. In general, surface area is related to particle size (that is, smaller particle size generally correlates to a larger specific surface area).
- **Particle size:** Particle size has been reported to be a significant factor affecting the bioavailability of dioxins and furans. As noted above, particle size is related to specific surface area, with smaller soil particle sizes favoring stronger binding to soil and thus decreasing desorption and bioavailability.
- **Hydrogen/Carbon/Nitrogen (H/C/N):** The H/C/N ratio is a measure of the aromatcity of a soil. Increasing H/C/N levels favor stronger binding to soil and sediment, and thus decreasing desorption and bioavailability of the chemical.
- **Black carbon (BC):** BC, a subdomain of SOM, has much higher affinity to planar HOCs than amorphous organic carbon, and has been found to be the predominant repository of many HOCs. BC particles that have sizes ranging from a few microns to above 100 micrometers (µm) are highly aromatic in structure and exhibit relatively low oxygen to organic carbon and H/C/N atomic ratios and low contents of oxygen-containing functional groups (Song et al., 2002). Comparable to diagenetically aged coal, shale, and cenospheres, BC also has a high carbon/oxygen (C/O) ratio and is responsible for strong HOC sorption (and limited bioavailability) because of its high specific surface areas and relatively reduced chemical nature. It has been proposed that the BC and possibly other distinct subfractions of bulk organic carbon can influence the bioavailability of HOCs (Bucheli and Gustafsson, 2001).

The parameters that will be analyzed as part of this study and the concentrations and levels of the parameters that affect bioavailability are listed in Table 2-2.

2.2.2 Additional Hazardous Substances

A target analyte list was developed by MDEQ for soil sampling at the Dow Midland Plant in September 2005. This list of chemicals, provided as Table 2-3, includes a variety of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, pesticides, and polychlorinated biphenyls (PCBs).

The list of target analytes for possible consideration as PCOIs may be amended based on the results of the MDEQ sampling on the Dow Plant planned for the week of June 5, 2006. These samples will be analyzed for the same chemicals as listed in Table 2-3 and for additional compounds known as tentatively identified compounds (TICs).

Process to Add TICs to Target Analyte List

TICs will be identified by the analytical laboratory by attempting to match mass spectral signatures for the unidentified compounds in each sample to published mass spectral signatures of chemicals in the National Institute of Standards and Technology, USEPA, National Institute of Health, or Wiley mass spectral libraries. TICs identified by the laboratory will only be considered for inclusion on the target analyte list if they have the following responses in the lowest dilution of a sample:

- A peak area greater than 50 percent of the closest eluting internal standard based on retention time
- Peak area counts in a laboratory blank present at 20 percent or less than observed in the sample

TICs producing a match of 85 percent or greater and that are detected in at least 5 percent of the samples will be added the list of target analytes for this investigation. To include these compounds in this investigation, the compounds will need to be identified no later than 4 to 6 weeks prior to the initiation of field work so that the laboratory has sufficient time to develop standards and establish method detection limits for compounds identified where these do not exist.

2.2.3 Dioxin and Furan Analysis

All of the samples collected during the investigation will be analyzed for the 17 dioxin and furan congeners listed in Table 2-4.

2.3 Sample Collection Procedures

The following sample collection procedures will be used at each designated sample location:

- Identify appropriate area for sample collection using the following guidelines:
  - Residential property: Samples will be preferentially collected from a visually undisturbed location in the central area in the front yard. The front of the house is preferable as it will likely be subject to less disturbances and be more easily accessible to the sampling team. Sample locations that will be avoided to the extent practical include gardens, recently landscaped areas, recently disturbed areas (based on visual inspection), and areas with evidence of disposal activities.
  - Commercial and industrial property: Samples will be preferentially collected from undeveloped or vegetated areas, such as wood lots and grassy areas. Sample locations that will be avoided to the extent practical include unpaved parking lots, industrial process areas, recently landscaped areas, and areas with evidence of disposal activities.
  - Public property: These properties include parks, schools, and highway medians. Samples will be preferentially collected from undeveloped or vegetated areas, such as wood lots and grassy areas. Sample locations that will be avoided to the extent practical include unpaved parking lots, recently landscaped areas, and areas with evidence of disposal activities.

- Surface materials, sod, and/or vegetation will be removed from the selected sampling location as described in Field Standard Operating Procedure (SOP) 2.1 (CH2M HILL, 2005b).
- Two sample intervals may be collected at each location: one representing the upper 1-inch of soil, and the other representing soil between 1 and 6 inches below grade (see Section 2.2). In accordance with the Midland soil sampling program conducted in 1996 (Dow, 2000), each sample will be made up of aliquots taken from the required sample depth intervals at 15 equally spaced subsample locations along the circumference of a 6-foot-diameter circle that has been deployed within the identified sample area. Hand tools such as stainless steel spoons, trowels, or other easily cleaned or disposable material will be used to collect the subsamples.
- The 15 aliquots will be mixed in a bowl and be transferred to sample containers to permit analysis for all analytical suites, except VOCs. The sample containers for VOC analysis will be filled without mixing by placing soil from one centrally located subsample location directly into the VOC sample container.
- Cleaned or disposable hand tools, bowls, and spoons will be used to mix and transfer the soil sample to appropriate sample containers.
- Excess soil not used to fill sample jars will be returned to the sample locations. Potting soil will be placed in the sample holes to bring the surface back to grade. Sod will be replaced and grass seed will be planted as necessary to restore vegetation.

2.3.1 Field Quality Control

Field quality control (QC) samples will be collected or prepared to assist in assessing data use. These QC samples will include field duplicates, laboratory QC samples (for matrix spikes [MS] and matrix spike duplicates [MSD]), temperature blanks, and trip blanks (for samples requiring VOC analysis). Field QC samples will be collected in accordance with Section 2.5 of the Quality Assurance Project Plan (QAPP) (CH2M HILL, 2005c).

Field duplicate samples will be collected at a minimum frequency of 1 per 10 samples and extra sample volumes for MS/MSD will be collected at a minimum frequency of 1 per 20 samples. If MDEQ desires split samples for chemical analysis, the locations (that is, sample station numbers) and sample intervals for such samples must be identified in advance so that adequate volumes of soil can be collected at each location selected for sampling.

The field duplicates, MS/MSDs, and MDEQ split samples required at residential sampling stations will be subject to the same sample management and anonymity procedures described for the target samples collected at these stations (see Section 2.4.1). Therefore, full sets of sample types (including the target sample, MDEQ split, field duplicate, or MS/MSD) must be collected at each of the selected sample locations within multiparcel sample stations, although only one of these sample sets will be submitted for laboratory analysis.

2.3.2 Sample Containers and Preservation

Analytical methods, sample bottle requirements, preservatives, and hold times associated with bioavailability parameter, dioxin and furan, and additional chemical analyses are provided in Table 2-5.

2.3.3 Equipment Decontamination

The field team will decontaminate reusable sampling equipment prior to commencement of sampling, between sample locations, and upon completion of the field activity. Separate sample processing equipment (that is, bowls, spoons, and trowels) will be dedicated to one location per day, and materials that come into direct contact with sample materials will be decontaminated or disposed of. Disposable equipment will be used whenever possible to avoid potential cross-contamination and reduce generation of decontamination fluids.

The field sampling team will decontaminate sampling equipment at the end of each sampling day at the field warehouse (this equipment will have been only used at one sampling location) as follows:

- Transfer equipment to the decontamination station (plastic-covered area with full containment of all fluids).
- Wash all equipment surfaces that contacted the potentially contaminated soil with detergent solution (Alconox or other laboratory-grade detergent), using a brush as needed to remove particulate matter and surface films.
- Rinse with potable water.
- Maintain decontaminated equipment in a position and location where it will not come into contact with contaminants.
- Transfer decontamination fluids to a sealable container, such as tubs, for later disposal.

2.3.4 Containment and Disposal of Investigation-Derived Waste

The procedures for the containment and disposal of investigation-derived waste (IDW) that will be generated during the field sampling activities will depend on the type and source of waste. Types of IDW are as follows:

- Excess soil
- Decontamination fluids
- Disposable equipment (for example, paper towels, gloves, core liners)

Excess soil will be returned to the location where it was obtained. Decontamination fluids, if generated, will be discharged at the field warehouse. Disposable equipment will be placed in garbage bags and be disposed as solid waste.

2.4 Sample Management Procedures

The sample management procedures for each sample station vary based upon the configuration, number of properties within the station, and location of the station. Multiparcel sample stations will be subjected to a procedure designed to protect the

anonymity of the property owner from which the samples are actually analyzed. Procedures for the various circumstances are described in the following sections.

2.4.1 Multiparcel Sample Stations

The sample management procedures for multiparcel sample stations have been designed to address community concerns about disclosure of sampling results before site-specific cleanup criteria are approved by MDEQ. The anonymity of the individual property owners will be protected by collecting samples from multiple properties within a sample station, randomly selecting the sample for analysis by a third party, and assigning a new sample identification number to the sample such that Dow, Dow-contractors, and MDEQ cannot determine the location from which the sample was collected. These procedures are illustrated in Figure 2-3 and described in more detail below:

- As described in Section 2.1, the sample stations were adjusted to include approximately nine or more individual properties where practical. This facilitates preservation of landowner anonymity by having a greater number of parcels from which to select a sample. All property owners within the sample station will be contacted for permission to sample their property. To help preserve anonymity, at least three property owners within each sample station will need to allow access for sampling to proceed.

- Samples will be collected at three to five of the properties allowing access. The procedures described in Section 2.3 will be used to collect the samples. The Dow sampling contractor will label each sample with a sample identification number and record information about its sample station, parcel number, land use, and other field observations on the field sampling record. If multiple sample intervals, QC samples, or collocate samples are collected at a station, the relevant information will also be indicated in the sample identification number.

- The labeled samples and sample information records will be transferred to a trusted third party under chain-of-custody procedures. The third party is anticipated to be a law firm mutually acceptable to MDEQ and Dow.

- The third party will take the samples to a secure location not accessible to Dow, Dow's contractors, or MDEQ and will relabel (or "blind") the samples in a randomized fashion so that the sampled parcel is not apparent from the sample identification number. Relevant information concerning sample depths, QC sample type, and/or collocate information will be maintained. The original and blinded sample identification numbers will only be known by the third party, who will be responsible for maintaining the sample records in a secure location.

- The third party will then randomly select one sample from each sample station to be submitted for laboratory analysis and return the relabeled sample to Dow's contractor under chain-of-custody procedures for shipment to the laboratory. Information that will be provided to Dow's contractor will include a list of the new sample identification numbers, the samples to be submitted for laboratory analysis, and the sample station for each new sample identification number. The sample station information is necessary so that the results obtained from the laboratory can be associated with a sample station, but not a specific property.

- Remaining relabeled samples will be placed in storage for potential future use. Circumstances under which these samples may be analyzed include the original sample selected for analysis is damaged or destroyed, concentrations within the sample station pose an unacceptable exposure, or additional information is needed following approval of site-specific criteria.
- Property owners may request a copy of the analytical results if their property is sampled. If requested, the results will be provided to property owners within the sample station. The results will only be identified by the sample station. The specific property analyzed from within the sample station will not be revealed. Neither MDEQ nor Dow will be informed of the identities of parties requesting this information.

Upon receipt of the analytical results, the Dow contractor will review the data and identify any samples in which dioxin and furan toxic equivalent (TEQ) concentrations exceed 1,000 parts per trillion (ppt). In cases where TEQ values exceed 1,000 ppt, Dow will notify MDEQ and the third party so that the appropriate landowner can be identified and be notified of the property's eligibility for interim action.

For samples analyzed for additional hazardous substances, MDEQ will review concentrations of detected hazardous substances to determine whether or not any compounds are present at concentrations that pose an unacceptable exposure. If unacceptable exposures are identified, MDEQ will notify Dow to discuss and agree upon the appropriate next steps. Following approval of site-specific cleanup criterion (SSCC) for dioxins and furans, the Dow contractor will review the data and identify samples that exceed the new criteria and notify the MDEQ and the third party so the landowner can be identified.

2.4.2 Single Owner Properties

The sample management procedures illustrated in Figure 2-3 and described below will be followed for single-owner properties:

- The property owner(s) within the station will be contacted for permission to sample their property.
- For single-owner sample stations, samples will be collected at a single location based on the sample location criteria described in Section 2.4. The Dow sampling contractor will label the samples with sample identification numbers based on the location and parcel number for the sample location (for example, Transect S, Box 3, Parcel 00118). If multiple sample intervals, QC type, or collocate samples are collected at a station, the relevant information will also be indicated in the sample identification number.
- The samples will be shipped under chain-of-custody procedures to the laboratory for analysis and the results returned to Dow's sampling contractor. Sample results will be provided to the property owner upon request.

The Dow contractor will review the analytical results to identify any locations in which TEQ concentrations exceed 1,000 ppt. If exceedances are identified, Dow will notify the landowner and MDEQ of the property's eligibility for interim action. Following approval of

SSCC for dioxins and furans, the Dow contractor will review the data and identify properties that exceed the new criteria and notify MDEQ.

For samples analyzed for additional hazardous substances, MDEQ will review concentrations of detected hazardous substances to determine whether or not any compounds are present at concentrations that pose an unacceptable exposure. If unacceptable exposures are identified, MDEQ will notify Dow to discuss and agree upon the appropriate next steps.

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
A-001	1	1	PCOI and D&F	14-21-20-210
A-002	2	2	PCOI, D&F, and Bio	14-21-20-186
				14-21-20-305
A-003	8	8	D&F and Bio	14-21-10-346
				14-21-10-350
				14-21-10-398
				14-21-10-400
				14-21-10-402
				14-21-10-404
				14-21-10-406
				14-21-10-408
A-004	10	10	D&F and Bio	14-16-40-488
				14-16-40-506
				14-16-40-576
				14-16-40-578
				14-16-40-580
				14-16-40-582
				14-16-40-604
				14-16-40-606
				14-16-40-608
				14-16-40-610
A-005	8	7	D&F and Bio	14-16-30-148
				14-16-30-150
				14-16-30-152
				14-16-30-154
				14-16-30-156
				14-16-30-158
				14-16-30-160
				14-16-30-162
A-006	9	9	D&F and Bio	14-16-30-022
				14-16-30-024
				14-16-30-026
				14-16-30-028
				14-16-30-030
				14-16-30-032
				14-16-30-034
				14-16-60-350
				14-16-60-352
A-007	11	11	D&F and Bio	14-16-70-124
				14-16-70-126
				14-16-70-130
				14-16-70-132
				14-16-70-134
				14-16-70-136
				14-16-70-138
				14-16-70-140
				14-16-70-142
				14-16-70-144
				14-16-70-146

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
A-008	11	11	D&F and Bio	14-16-80-152
				14-16-80-154
				14-16-80-156
				14-16-80-158
				14-16-80-160
				14-16-80-162
				14-16-80-172
				14-16-80-174
				14-16-80-176
				14-16-80-178
				14-16-80-180
A-009	8	8	D&F and Bio	14-16-80-376
				14-16-80-380
				14-16-80-384
				14-16-80-386
				14-16-80-426
				14-16-80-430
				14-16-80-434
				14-16-80-438
A-010	5	5	D&F and Bio	14-09-50-102
				14-09-50-104
				14-09-50-106
				14-09-50-110
				14-09-50-114
A-011	1	1	D&F and Bio	14-09-50-300
A-012	1	1	D&F and Bio	14-09-50-300
A-013	13	13	D&F and Bio	14-09-70-070
				14-09-70-072
				14-09-70-074
				14-09-70-076
				14-09-70-078
				14-09-70-080
				14-09-70-082
				14-09-70-084
				14-09-70-086
				14-09-70-088
				14-09-70-090
				14-09-70-092
				14-09-70-094
B-001	4	1	PCOI, D&F, and Bio	14-21-20-004
				14-21-20-044
				14-21-20-062
				14-21-20-066
B-002	1	1	PCOI and D&F	14-21-20-140
B-003	10	9	D&F and Bio	14-21-10-040
				14-21-10-042
				14-21-10-044
				14-21-10-046
				14-21-10-048
				14-21-10-050
				14-21-10-052
				14-21-10-054
				14-21-10-270
				14-21-10-278

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
B-004	10	10	D&F and Bio	14-16-40-126
				14-16-40-128
				14-16-40-130
				14-16-40-132
				14-16-40-134
				14-16-40-144
				14-16-40-146
				14-16-40-148
				14-16-40-150
				14-16-40-152
B-005	8	8	D&F and Bio	14-16-30-510
				14-16-30-512
				14-16-40-238
				14-16-40-240
				14-16-40-248
				14-16-40-250
				14-16-40-284
				14-16-40-328
B-006	2	2	D&F and Bio	14-16-20-584
				14-16-30-200
B-007	10	10	D&F and Bio	14-16-20-400
				14-16-20-402
				14-16-20-406
				14-16-20-408
				14-16-20-410
				14-16-20-412
				14-16-20-414
				14-16-20-416
				14-16-20-418
				14-16-20-420
B-008	8	8	D&F and Bio	14-16-10-174
				14-16-10-176
				14-16-10-178
				14-16-10-180
				14-16-10-182
				14-16-10-190
				14-16-10-194
				14-16-20-002
B-009	10	10	D&F and Bio	14-16-10-118
				14-16-10-126
				14-16-10-128
				14-16-10-156
				14-16-10-376
				14-16-10-378
				14-16-10-380
				14-16-10-382
				14-16-10-384
				14-16-10-386
B-010	1	1	D&F and Bio	14-09-40-002
B-011	1	1	D&F and Bio	14-09-50-300
C-001	3	1	PCOI, D&F, and Bio	14-22-70-102
				14-22-70-104
				14-22-70-106

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
C-002	4	3	PCOI and D&F	14-22-70-010
				14-22-70-016
				14-22-70-022
				14-22-70-028
C-003	13	9	D&F and Bio	14-22-80-240
				14-22-80-246
				14-22-80-248
				14-22-80-250
				14-22-80-254
				14-22-80-256
				14-22-80-258
				14-22-80-260
				14-22-80-262
				14-22-80-274
				14-22-80-276
				14-22-80-278
				14-22-80-280
C-004	11	11	D&F and Bio	14-15-50-730
				14-15-50-732
				14-15-50-734
				14-15-50-736
				14-15-50-738
				14-15-50-754
				14-15-50-756
				14-15-50-758
				14-15-50-760
				14-15-50-762
				14-15-50-764
C-005	10	9	D&F and Bio	14-15-50-402
				14-15-50-404
				14-15-50-406
				14-15-50-408
				14-15-50-410
				14-15-50-412
				14-15-60-482
				14-15-60-484
				14-15-60-504
				14-15-60-506
C-006	10	10	D&F and Bio	14-15-60-440
				14-15-60-442
				14-15-60-444
				14-15-60-446
				14-15-60-448
				14-15-60-450
				14-15-60-452
				14-15-60-454
				14-15-60-456
				14-15-60-458

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
C-007	11	11	D&F and Bio	14-15-70-314
				14-15-70-316
				14-15-70-318
				14-15-70-320
				14-15-70-324
				14-15-70-326
				14-15-70-328
				14-15-70-330
				14-15-70-332
				14-15-70-334
				14-15-70-336
C-008	1	1	D&F and Bio	14-15-70-440
C-010	13	13	D&F and Bio	14-10-50-510
				14-10-50-514
				14-10-50-518
				14-10-50-524
				14-10-50-530
				14-10-50-532
				14-10-50-534
				14-10-50-536
				14-10-50-538
				14-10-50-540
				14-10-50-542
				14-10-50-546
				14-10-50-550
C-011	10	10	D&F and Bio	14-10-60-008
				14-10-60-014
				14-10-60-016
				14-10-60-018
				14-10-60-020
				14-10-60-022
				14-10-60-088
				14-10-60-092
				14-10-60-094
				14-10-60-096
C-013	5	5	D&F and Bio	14-10-70-014
				14-10-70-018
				14-10-70-020
				14-10-70-024
				14-10-70-028
D-001	1	1	PCOI and D&F	14-22-80-356
D-002	9	8	PCOI, D&F, and Bio	14-15-50-626
				14-15-50-628
				14-15-50-630
				14-15-50-636
				14-15-50-650
				14-15-50-660
				14-15-50-664
				14-15-50-672
				14-15-50-674

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
D-003	15	14	D&F and Bio	14-15-50-464
				14-15-50-530
				14-15-50-532
				14-15-50-534
				14-15-50-536
				14-15-50-538
				14-15-50-540
				14-15-50-542
				14-15-50-550
				14-15-50-586
				14-15-50-588
				14-15-50-590
				14-15-50-592
				14-15-50-594
				14-15-50-650
D-004	10	10	D&F and Bio	14-15-60-142
				14-15-60-144
				14-15-60-146
				14-15-60-148
				14-15-60-150
				14-15-60-152
				14-15-60-154
				14-15-60-156
				14-15-60-158
				14-15-60-162
D-005	10	9	D&F and Bio	14-15-60-290
				14-15-60-292
				14-15-60-294
				14-15-60-296
				14-15-60-298
				14-15-60-300
				14-15-60-304
				14-15-60-306
				14-15-60-310
				14-15-60-312
E-001	2	2	PCOI, D&F, and Bio	14-22-80-396
				14-22-80-420
E-002	1	1	PCOI, D&F, and Bio	14-22-80-012
E-003	7	7	D&F and Bio	14-15-50-010
				14-15-50-012
				14-15-50-014
				14-15-50-016
				14-15-50-018
				14-15-50-020
				14-15-50-222
E-004	9	8	D&F and Bio	14-15-60-096
				14-15-60-098
				14-15-60-100
				14-15-60-102
				14-15-60-104
				14-15-60-106
				14-15-60-108
				14-15-60-110
				14-15-60-112
E-005	1	1	D&F and Bio	14-15-20-004

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
E-006	1	1	D&F and Bio	14-15-20-004
E-007	12	12	D&F and Bio	14-15-10-430
				14-15-10-432
				14-15-10-434
				14-15-10-436
				14-15-10-438
				14-15-10-440
				14-15-10-464
				14-15-10-466
				14-15-10-468
				14-15-10-470
				14-15-10-472
				14-15-10-474
E-008	13	13	D&F and Bio	14-10-40-124
				14-10-40-126
				14-10-40-130
				14-10-40-134
				14-10-40-136
				14-10-40-138
				14-10-40-140
				14-10-40-192
				14-10-40-194
				14-10-40-196
				14-10-40-202
				14-10-40-204
				14-10-40-206
E-009	10	10	D&F and Bio	14-10-40-522
				14-10-40-524
				14-10-40-526
				14-10-40-528
				14-10-40-530
				14-10-40-532
				14-10-40-560
				14-10-40-562
				14-10-40-564
				14-10-40-568
E-010	1	1	D&F and Bio	14-10-30-500
E-011	12	12	D&F and Bio	14-10-20-604
				14-10-20-606
				14-10-20-608
				14-10-20-610
				14-10-20-612
				14-10-20-614
				14-10-20-618
				14-10-20-622
				14-10-20-624
				14-10-20-626
				14-10-20-628
				14-10-20-630
F-001	1	1	PCOI, D&F, and Bio	14-22-80-436
F-002	1	1	PCOI, D&F, and Bio	14-22-10-180

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
F-004	12	12	D&F and Bio	14-15-30-316
				14-15-30-318
				14-15-30-320
				14-15-30-322
				14-15-30-324
				14-15-30-326
				14-15-30-376
				14-15-30-378
				14-15-30-380
				14-15-30-382
				14-15-30-384
				14-15-30-386
F-005	14	14	D&F and Bio	14-15-30-024
				14-15-30-026
				14-15-30-028
				14-15-30-030
				14-15-30-032
				14-15-30-034
				14-15-30-036
				14-15-30-038
				14-15-30-040
				14-15-30-042
				14-15-30-044
				14-15-30-046
				14-15-30-048
				14-15-30-050
G-001	1	1	PCOI and D&F	14-22-20-150
G-002	1	1	PCOI, D&F, and Bio	14-22-20-150
G-003	1	1	D&F and Bio	14-23-10-100
G-004	1	1	D&F and Bio	14-15-40-130
G-005	10	10	D&F and Bio	14-15-40-064
				14-15-40-066
				14-15-40-068
				14-15-40-070
				14-15-40-072
				14-15-40-100
				14-15-40-102
				14-15-40-104
				14-15-40-106
				14-15-40-108
G-006	1	1	D&F and Bio	14-14-60-002
G-007	1	1	D&F and Bio	14-14-60-002
G-008	11	10	D&F and Bio	14-14-70-070
				14-14-70-072
				14-14-70-074
				14-14-70-077
				14-14-70-078
				14-14-70-082
				14-14-70-086
				14-14-70-088
				14-14-70-090
				14-14-70-092
				14-14-70-094

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
G-009	13	13	D&F and Bio	14-14-80-184
				14-14-80-186
				14-14-80-188
				14-14-80-190
				14-14-80-192
				14-14-80-194
				14-14-80-196
				14-14-80-198
				14-14-80-200
				14-14-80-202
				14-14-80-204
				14-14-80-206
				14-14-80-210
G-010	9	9	D&F and Bio	14-14-10-308
				14-14-10-314
				14-14-10-318
				14-14-10-490
				14-14-10-494
				14-14-10-496
				14-14-10-498
				14-14-10-502
				14-14-10-504
G-011	8	8	D&F and Bio	14-11-40-054
				14-11-40-056
				14-11-40-058
				14-11-40-060
				14-11-40-080
				14-11-40-082
				14-11-40-084
				14-11-40-086
G-012	11	11	D&F and Bio	14-11-30-204
				14-11-30-206
				14-11-30-208
				14-11-30-220
				14-11-30-222
				14-11-30-224
				14-11-30-226
				14-11-40-474
				14-11-40-476
				14-11-40-478
				14-11-40-480
H-002	1	1	PCOI, D&F, and Bio	14-22-20-150
H-003	1	1	PCOI, D&F, and Bio	14-21-30-007
H-004	1	1	D&F and Bio	14-14-60-002
H-005	1	1	D&F and Bio	14-14-60-002
I-001	1	1	PCOI, D&F, and Bio	14-22-20-150
I-002	1	1	PCOI, D&F, and Bio	14-21-30-007
I-004	1	1	D&F and Bio	14-23-10-200
I-005	1	1	D&F and Bio	14-14-30-010
I-006	1	1	D&F and Bio	14-14-30-010
I-007	1	1	D&F and Bio	14-14-30-010
I-008	1	1	D&F and Bio	14-14-30-010
I-009	1	1	D&F and Bio	14-13-10-800
I-010	1	1	D&F and Bio	14-13-10-800
J-001	1	1	PCOI and D&F	14-22-30-004

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
J-002	7	6	PCOI and D&F	14-23-70-036
				14-23-70-042
				14-23-70-044
				14-23-70-046
				14-23-70-048
				14-23-70-050
				14-23-70-056
K-001	1	1	PCOI, D&F, and Bio	14-21-30-006
K-002	11	6	PCOI and D&F	14-23-60-330
				14-23-60-340
				14-23-60-342
				14-23-60-346
				14-23-60-348
				14-23-60-356
				14-23-60-370
				14-23-60-372
				14-23-60-374
				14-23-60-376
				14-23-60-378
K-003	1	1	D&F and Bio	14-23-60-132
K-004	15	13	D&F and Bio	14-23-30-430
				14-23-30-432
				14-23-30-438
				14-23-30-442
				14-23-30-446
				14-23-30-466
				14-23-30-468
				14-23-30-472
				14-23-30-474
				14-23-60-020
				14-23-60-024
				14-23-60-028
				14-23-60-032
				14-23-60-036
				14-23-60-040
K-005	14	12	D&F and Bio	14-23-30-266
				14-23-30-268
				14-23-30-270
				14-23-30-272
				14-23-30-274
				14-23-30-278
				14-23-30-280
				14-23-30-282
				14-23-30-286
				14-23-30-288
				14-23-30-290
				14-23-30-292
				14-23-30-294
				14-23-30-300

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
K-006	8	8	D&F and Bio	14-23-30-032
				14-23-30-034
				14-23-30-036
				14-23-30-042
				14-23-30-044
				14-23-30-045
				14-23-30-046
				14-23-30-047
K-007	10	10	D&F and Bio	14-24-70-012
				14-24-70-014
				14-24-70-016
				14-24-70-020
				14-24-70-022
				14-24-70-062
				14-24-70-064
				14-24-70-066
				14-24-70-068
				14-24-70-072
K-008	12	10	D&F and Bio	14-24-70-164
				14-24-70-168
				14-24-70-170
				14-24-70-174
				14-24-70-176
				14-24-70-178
				14-24-70-274
				14-24-70-278
				14-24-70-280
				14-24-70-284
				14-24-70-286
				14-24-70-289
K-009	1	1	D&F and Bio	14-24-70-301
K-010	1	1	D&F and Bio	14-24-20-004
K-011	2	1	D&F and Bio	14-24-20-004
				14-24-20-366
L-001	1	1	PCOI and D&F	14-23-50-050
L-002	1	1	PCOI, D&F, and Bio	14-23-50-050
L-003	1	1	D&F and Bio	14-23-50-050
L-004	1	1	D&F and Bio	14-23-40-310
L-005	1	1	D&F and Bio	14-23-40-210
M-001	2	1	PCOI, D&F, and Bio	14-26-80-260
				14-26-80-270
M-002	1	1	PCOI, D&F, and Bio	14-26-80-260
M-003	1	1	D&F and Bio	14-26-80-260
M-004	1	1	D&F and Bio	14-26-80-260
M-005	1	1	D&F and Bio	14-26-80-260
M-006	1	1	D&F and Bio	14-26-80-260
M-007	1	1	D&F and Bio	14-25-80-240
M-008	1	1	D&F and Bio	14-25-80-240
M-009	1	1	D&F and Bio	14-25-80-240
M-010	1	1	D&F and Bio	14-25-80-420
M-011	1	1	D&F and Bio	14-25-80-420
N-001	1	1	PCOI and D&F	14-21-30-006
N-003	1	1	PCOI, D&F, and Bio	14-26-80-420
O-001	1	1	PCOI and D&F	14-21-30-006
O-003	1	1	PCOI, D&F, and Bio	14-26-80-420

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
Q-001	1	1	PCOI and D&F	14-27-50-500
Q-002	1	1	PCOI and D&F	14-27-50-500
R-001	1	1	PCOI, D&F, and Bio	14-33-10-100
R-002	9	6	PCOI, D&F, and Bio	120-033-200-251-00
				120-033-200-252-00
				120-033-200-253-00
				120-755-500-460-00
				120-755-500-470-00
				120-755-500-480-00
				120-755-500-490-00
				120-755-500-500-00
				120-755-500-510-00
R-003	1	1	D&F and Bio	120-033-200-622-00
R-004	11	4	D&F and Bio	120-033-200-450-00
				120-033-200-455-00
				120-033-200-460-00
				120-033-200-470-00
				120-033-200-512-00
				120-033-300-540-00
				120-033-300-550-00
				120-033-300-560-00
				120-033-300-570-00
				120-033-300-580-00
				120-033-300-590-00
S-001	1	1	PCOI, D&F, and Bio	120-028-300-190-00
S-002	9	9	PCOI, D&F, and Bio	120-600-500-080-00
				120-600-500-090-00
				120-600-500-100-00
				120-600-500-120-00
				120-600-500-130-00
				120-600-500-140-00
				120-600-500-150-00
				120-600-500-160-00
				120-600-500-180-00
S-003	3	2	D&F and Bio	120-029-400-256-00
				120-029-400-280-00
				120-029-400-290-00
S-004	7	3	D&F and Bio	120-032-100-110-00
				120-032-100-120-00
				120-450-500-010-00
				120-450-500-020-00
				120-450-500-030-00
				120-450-500-110-00
				120-450-500-120-00
T-001	6	4	PCOI, D&F, and Bio	120-029-100-885-00
				120-029-100-887-00
				120-029-100-910-00
				120-029-100-953-00
				120-029-100-955-00
				120-029-100-956-00
T-002	1	1	PCOI, D&F, and Bio	120-029-100-810-00

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
T-003	10	3	D&F and Bio	120-029-100-530-00
				120-029-100-590-00
				120-029-100-605-00
				120-029-100-620-00
				120-029-100-631-00
				120-029-400-860-00
				120-029-400-865-00
				120-029-400-881-00
				120-029-400-886-00
				120-029-400-930-00
T-004	9	3	D&F and Bio	120-029-100-550-00
				120-029-200-756-00
				120-029-200-776-00
				120-029-200-801-00
				120-029-300-390-00
				120-029-300-400-00
				120-029-300-410-00
				120-029-300-420-00
				120-029-400-920-00
U-001	1	1	PCOI, D&F, and Bio	14-21-30-006
U-002	1	1	PCOI, D&F, and Bio	14-21-30-006
U-003	1	1	D&F and Bio	14-21-30-006
U-004	1	1	D&F and Bio	14-20-60-280
V-001	1	1	PCOI and D&F	14-21-80-680
V-002	1	1	PCOI and D&F	14-21-80-104
V-004	10	8	D&F and Bio	14-16-60-520
				14-16-60-522
				14-16-60-524
				14-16-60-526
				14-16-60-530
				14-16-60-538
				14-16-60-540
				14-16-60-542
				14-16-60-546
				14-16-60-548
V-005	9	8	D&F and Bio	14-17-30-060
				14-17-30-062
				14-17-30-064
				14-17-30-066
				14-17-30-068
				14-17-30-070
				14-17-30-072
				14-17-30-074
				14-17-30-076
V-006	10	10	D&F and Bio	14-17-20-086
				14-17-20-090
				14-17-20-092
				14-17-20-094
				14-17-20-096
				14-17-20-098
				14-17-20-124
				14-17-20-126
				14-17-20-130
				14-17-20-134
V-007	1	1	D&F and Bio	14-17-20-280

Table 2-1
Sampling Station Information
Sampling and Analysis Plan in Support of Bioavailability Study

Sampling Station	Number of Parcels	Number of Owners	Analyses to be Conducted	Parcel Numbers
V-008	1	1	D&F and Bio	14-17-20-240
V-009	1	1	D&F and Bio	14-08-40-500
V-010	9	9	D&F and Bio	14-08-50-074
				14-08-50-076
				14-08-50-078
				14-08-50-080
				14-08-50-086
				14-08-50-088
				14-08-50-090
				14-08-50-092
				14-08-50-094
W-001	1	1	PCOI, D&F, and Bio	14-21-20-266
W-003	13	12	PCOI, D&F, and Bio	14-21-80-468
				14-21-80-470
				14-21-80-472
				14-21-80-476
				14-21-80-478
				14-21-80-480
				14-21-80-482
				14-21-80-484
				14-21-80-486
				14-21-80-488
				14-21-80-490
				14-21-80-492
				14-21-80-494
W-004	9	9	D&F and Bio	14-16-50-038
				14-16-50-040
				14-16-50-042
				14-16-50-044
				14-16-50-046
				14-16-50-048
				14-16-50-050
				14-16-50-052
				14-16-50-054
W-005	1	1	D&F and Bio	14-16-50-900
W-006	11	10	D&F and Bio	14-16-60-402
			D&F and Bio	14-16-60-404
			D&F and Bio	14-16-60-406
			D&F and Bio	14-16-60-408
			D&F and Bio	14-16-60-410
			D&F and Bio	14-16-60-412
			D&F and Bio	14-16-60-442
			D&F and Bio	14-16-60-446
			D&F and Bio	14-16-60-448
			D&F and Bio	14-16-60-450
			D&F and Bio	14-16-60-452

TABLE 2-2
Soil Physical and Geochemical Parameters of Interest
Sampling and Analysis Plan in Support of Bioavailability Study

Parameter[a]	Estimated Range
Soil particle size distribution	Not determined, no data set to estimate ranges
Specific surface area (SA)	Not determined, no data set to estimate ranges
Soil organic matter content (SOM)	1 to 35%
Soil organic carbon content (SOC)	0.5 to 15% (approximately 58% of f_{om})
Black carbon content (BC)	1 to 20% of the total organic carbon
Ratio of hydrogen/carbon/nitrogen (H/C/N)	Not determined, no data set to estimate ranges

[a] Qiu and Davis, 2004

TABLE 2-3
List of Additional Chemicals
Sampling and Analysis Plan in Support of Bioavailability Study

Analytes	CAS Number[a]
Acenapthene	83-32-9
Acenaphthylene	208-96-8
Acrylonitrile	107-13-1
Aldrin	309-00-2
Aluminum (Al)	7429-90-5
Anthracene	120-12-7
Antimony (Sb)	7440-36-0
Arsenic (As)	7440-38-2
Barium (Ba)	7440-39-3
Benzene	71-43-2
Benzo(a)pyrene	50-32-8
Benzo(b)fluoranthene	205-99-2
Benzo(ghi)perylene	191-24-2
Benzo(k)fluoranthene	207-08-9
Beryllium (Be)	7440-41-7
alpha-BHC (alpha.-Hexachlorocyclohexane)	319-84-6
beta-BHC (beta.-Hexachlorocyclohexane)	319-85-7
delta-BHC (delta.-Hexachlorocyclohexane)	319-86-8
gamma-BHC (Lindane)	58-89-9
Bromodichloromethane (Dichlorobromomethane)	75-27-4
Bromoform (Tribromomethane)	75-25-2
p-Bromophenyl phenyl ether	101-55-3
Boron (B)	7440-42-8
Butyl benzyl phthalate	85-68-7
Cadmium (Cd)	7440-43-9
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
a-Chlordane (cis-Chlordane)	5103-71-9
g-Chlordane (trans-Chlordane)	5103-74-2
bis(2-chlorethyl) ether	111-44-4
Chlorobenzene	108-90-7
Chloroethane	75-00-3
Chloroform	67-66-3
2-Chloronapthalene	91-58-7
2-Chlorophenol	95-57-8
4-Chlorophenyl phenyl ether	7005-72-3
Chromium (Cr)	7440-47-3
Chrysene	218-01-9
Cobalt (Co)	7440-48-4
Copper (Cu)	7440-50-8
4,4'-DDD (p,p'-DDD)	72-54-8
4,4'-DDE (p,p'-DDE)	72-55-9
4,4'-DDT (p,p'-DDT)	50-29-3
Di-n-butyl phthalate (Dibutyl phthalate)	84-74-2

TABLE 2-3
List of Additional Chemicals
Sampling and Analysis Plan in Support of Bioavailability Study

Analytes	CAS Number[a]
Di-n-octyl phthalate	117-84-0
Dibenzofuran	132-64-9
Dibenz(a,h)anthracene	53-70-3
1,2-Dibromo-3-chloropropane	96-12-8
Dibromochloromethane (Chlorodibromomethane)	124-48-1
1,2-Dibromoethane	106-93-4
trans-1,4-Dichloro-2-butene	110-57-6
1,3-Dichlorobenzene	541-73-1
1,2-Dichlorobenzene	95-50-1
1,4-Dichlorobenzene	106-46-7
Dichlorodifluoromethane (CFC-12)	75-71-8
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
trans-1,2-Dichloroethylene	156-60-5
2,4-Dichlorophenol	120-83-2
1,2-Dichlorpropane	78-87-5
cis-1,3-Dichloropropene (1-Propene, 1,3-dichloro-, (Z)-)	10061-01-5
trans-1,3-Dichloropropene	10061-02-6
Dieldrin	60-57-1
Diethyl phthalate	84-66-2
2,4-Dimethylphenol	105-67-9
2,4-Dinitrophenol	51-28-5
2,4-Dinitrotoluene	121-14-2
2,6-Dinitrotoluene	606-20-2
Endosulfan I (.alpha.-Endosulfan)	959-98-8
Endosulfan II (.beta.-Endosulfan)	33213-65-9
Endosulfan sulfate	1031-07-8
Endrin	72-20-8
Endrin aldehyde	7421-93-4
Ethylbenzene	100-41-4
Fluoranthene	206-44-0
Fluorene	86-73-7
Heptachlor	76-44-8
Heptachlor epoxide	1024-57-3
Hexachlorobenzene	118-74-1
Hexachlorobutadiene	87-68-3
Hexachlorocyclopentadiene	77-47-4
Hexachloroethane	67-72-1
2-Hexanone	591-78-6
Indeno(1,2,3-cd)pyrene	193-39-5
Iron (Fe)	7439-89-6
Isophorone	78-59-1
Lead (Pb)	7439-92-1
Manganese (Mn)	7439-96-5
Magnesium (Mg)	7439-95-4
Mercury (Hg)	7439-97-6

TABLE 2-3
List of Additional Chemicals
Sampling and Analysis Plan in Support of Bioavailability Study

Analytes	CAS Number[a]
bis(2-chloroethoxy)Methane	111-91-1
Methoxychlor	72-43-5
Methyl iodide	74-88-4
4-Methyl-2-pentanone	108-10-1
Methylene chloride	75-09-2
2-Methylnaphthalene	91-57-6
Mirex	2385-85-5
Naphthalene	91-20-3
Nickel (Ni)	7440-02-0
Nitrobenzene	98-95-3
N-Nitrosodimethylamine	62-75-9
N-Nitrosodiphenylamine	86-30-6
Pentachlorophenol	87-86-5
Phenanthrene	85-01-8
Phenol	108-95-2
bis(2-ethylhexyl) phthalate	117-81-7
Potassium (K)	7440-09-7
Aroclor 1242	53469-21-9
Aroclor 1254	11097-69-1
Aroclor 1260	11096-82-5
Aroclor 1221	11104-28-2
Aroclor 1232	11141-16-5
Aroclor 1248	12672-29-6
Aroclor 1262	37324-23-5
Aroclor 1268	11100-14-4
Pyrene	129-00-0
Selenium (Se)	7782-49-2
Silver (Ag)	7440-22-4
Sodium (Na)	7440-23-5
Strontium (Sr)	7440-24-6
Styrene	100-42-5
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2,-Tetrachloroethane	79-34-5
Thallium	7440-28-0
Toluene	108-88-3
Toxaphene	8001-35-2
1,2,3-Trichlorobenzene	87-61-6
1,2,4-Trichlorobenzene	120-82-1
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethylene	79-01-6
Trichlorfluoromethane (CFC-11)	75-69-4
2,4,5-Trichlorophenol	95-95-4
2,4,6-Trichlorophenol	88-06-2
1,2,3-Trichloropropane	96-18-4

TABLE 2-3
List of Additional Chemicals
Sampling and Analysis Plan in Support of Bioavailability Study

Analytes	CAS Number[a]
Vanadium	7440-62-2
Vinyl chloride	75-01-4
Zinc (Zn)	7440-66-6

[a] CAS Number from USEPA substance registry website (http://www.epa.gov/srs)

TABLE 2-4
List of Dioxin and Furan Congeners
Sampling and Analysis Plan in Support of Bioavailability Study

Analyte	CAS Number
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6
1,2,3,4,7,8-Hexachlorodibenzofuran	55684-94-1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6
2,3,4,6,7,8-Hexachlorodibenzofuran	70648-26-9
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9
Octachlorodibenzodioxin	3268-87-9
Octachlorodibenzofuran	39001-02-0

TABLE 2-5
Required Analytical Method, Sample Containers, Preservation, and Holding Times
Sampling and Analysis Plan in Support of Bioavailability Study

Analysis	Preparatory/ Analytical Method	Sample Matrix[a]	Container[b]	Preservative[c]	Holding Time[d]
Bioavailability Parameters					
Soil particle size	ASTM D422 Size separation (sieve)[e]	S	4-oz glass	< 10°C	NA
Specific surface area	BET nitrogen gas physisorption (static pressure technique)[f]	S	4-oz glass	< 10°C	NA
Soil organic matter	Loss by ignition[f]	S	4-oz glass	< 10°C	NA
Soil organic carbon content	Combustion[f]	S	4-oz glass	< 10°C	NA
Black carbon content	Combustion[f]	S	4-oz glass	< 10°C	NA
Ratio of hydrogen/carbon/ nitrogen	Elemental analyzer[f]	S	4-oz glass	< 10°C	NA
Dioxins and Furans					
Dioxins and furans	SW-846 8290/EPA Method 1613	W	1-L amber glass	Cool 4°C	30/45 days[g]
		S	8-oz glass		
Additional Chemicals					
Volatile organic compounds	SW-846 5030B/8260B	W	40-mL, glass	HCl, pH < 2, cool to 4ºC	14 days
	SW-846 5035/8260B	S	5 g–Encore or equivalent sampling technique	Cool 4°C, or $NaHSO_4$,and Cool 4°C	48 hours from collection to preservation, 14 days to analysis
			40-mL, glass	Methanol, cool to 4ºC	
Semivolatile organic compounds	SW-846 3510C/3520C/ 8270C	W	1-L amber glass	Cool 4°C	7/40 days[h]
	SW-846 3550B/ 8270C	S	4-oz glass	Cool 4°C	14/40 days[i]
Organochlorine pesticides	SW-846 3510C/3520C/ 8081A	W	1-L amber glass	Cool 4°C	7/40 days[h]
	SW-846 3550B/8081A Cleanup – 3620B	S	4-oz glass	Cool 4°C	14/40 days[i]
Organophosphorous pesticides	SW-846 3510C/3520C/ 8141A	W	1-L amber glass	Cool 4°C	7/40 days[h]
	SW-846 3550B/8141A	S	4-oz glass	Cool 4°C	14/40 days[i]

TABLE 2-5
Required Analytical Method, Sample Containers, Preservation, and Holding Times
Sampling and Analysis Plan in Support of Bioavailability Study

Analysis	Preparatory/ Analytical Method	Sample Matrix[a]	Container[b]	Preservative[c]	Holding Time[d]
Herbicides	SW-846 3510C/8151A	W	1-L amber glass	Cool 4°C	7/40 days[h]
	SW-846 3550B/8151A	S	4-oz glass	Cool 4°C	14/40 days[i]
Polychlorinated Biphenyls	SW-846 3510C/3520C/8082	W	1-L amber glass	Cool 4°C	7/40 days[h]
	SW-846 3550B/8082 Cleanup – 3665A	S	4-oz glass	Cool 4°C	14/40 days[i]
Metals (total)	SW-846 3010A/3020A-SW6010B Series	W	500-mL polyethylene	HNO_3, pH < 2 Cool 4°C	6 months
	SW-846 3050-SW6010B /7000 Series	S	2-oz glass	Cool 4°C,	
Mercury	SW-846 7470A	W	500-mL polyethylene	HNO_3, pH < 2 Cool 4°C	28 days
	SW-846 7471A	S	2-oz glass	Cool 4°C,	
Cyanide	SW-846 9010B/9012A	W	1-L polyethylene	pH>12 NaOH Ascorbic Acid as needed (.6g)	14 days
		S	4-oz glass	Cool 4°C	
Total Organic Carbon	EPA 415.1/SW-846 9060	W	250-mL glass	H_2SO_4 or HCl pH < 2, Cool 4°C	28 days
		S	2-oz glass	Cool 4°C	
Percent Moisture	EPA 160.3/ASTM D2216	S	2-oz glass	None	NA

Sample container and volume requirements will be specified by the analytical laboratory performing the tests. Three times the required volume should be collected for samples designated as MS/MSD samples.

a Sample matrix: S = surface soil, subsurface soil, sediment; W = surface water.
b All containers will be sealed with Teflon®-lined screw caps.
c All samples will be stored promptly at 4°C in an insulated chest.
d Holding times are from the time of sample collection.
e 30 days to extraction for water, 45 days for analysis.
f Dane and Topp, 2002.
g Brunauer et al., 1938.
h 7 days to extraction for water, 40 days for analysis.
I 14 days for extraction for soil, 40 days for analysis.

°C = degrees Centigrade
mL = milliliter
L = liter
oz = ounce
NaOH = sodium hydroxide
H_2SO_4 = sulfuric acid
BET =Brunauer-Emmett-Teller
EPA = U.S. Environmental Protection Agency
ASTM = American Society for Testing and Materials
NA = not applicable
HNO_3 = nitric acid

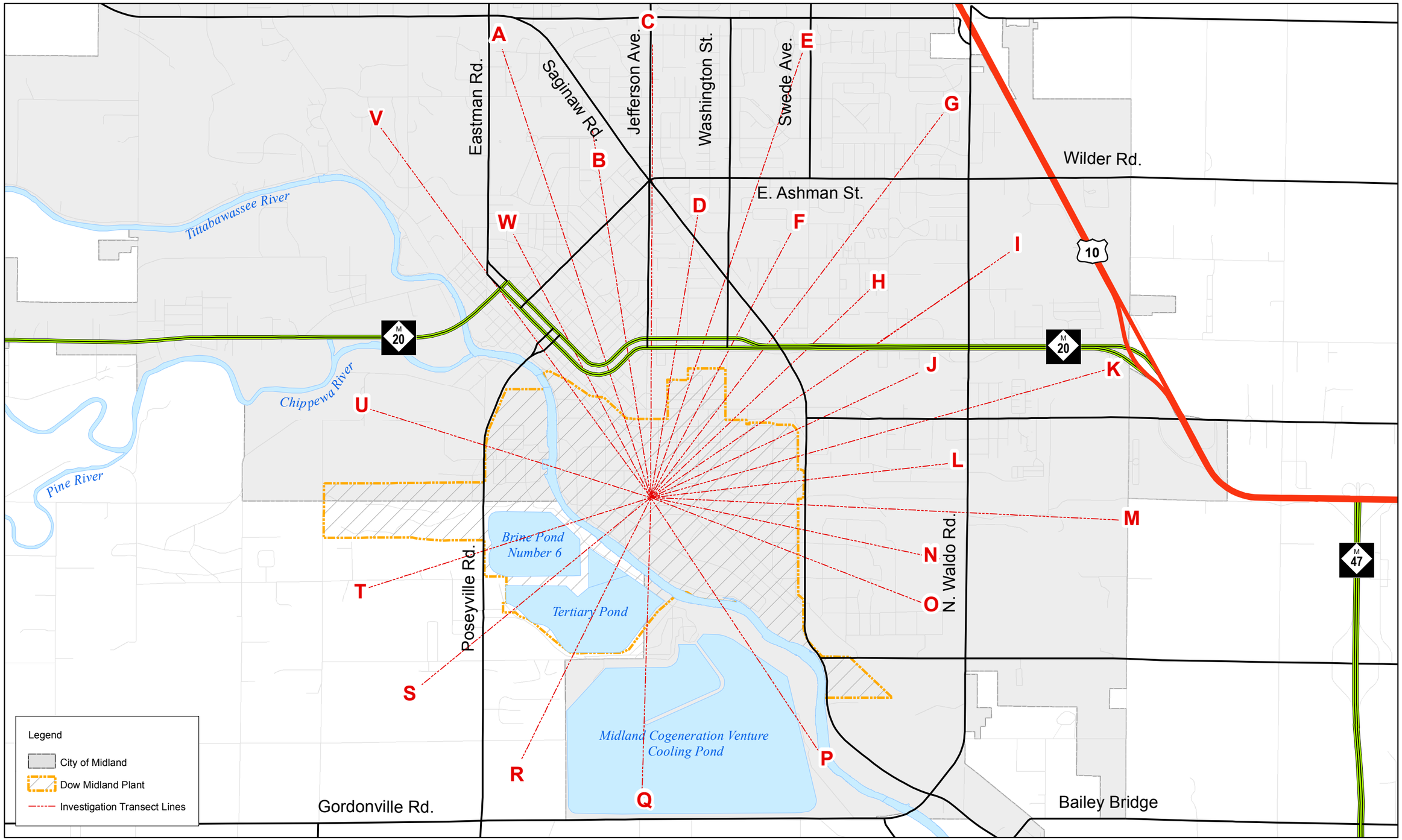

Figure 2-1
Investigation Transect Lines
Sampling and Analysis Plan in Support of Bioavailability Study

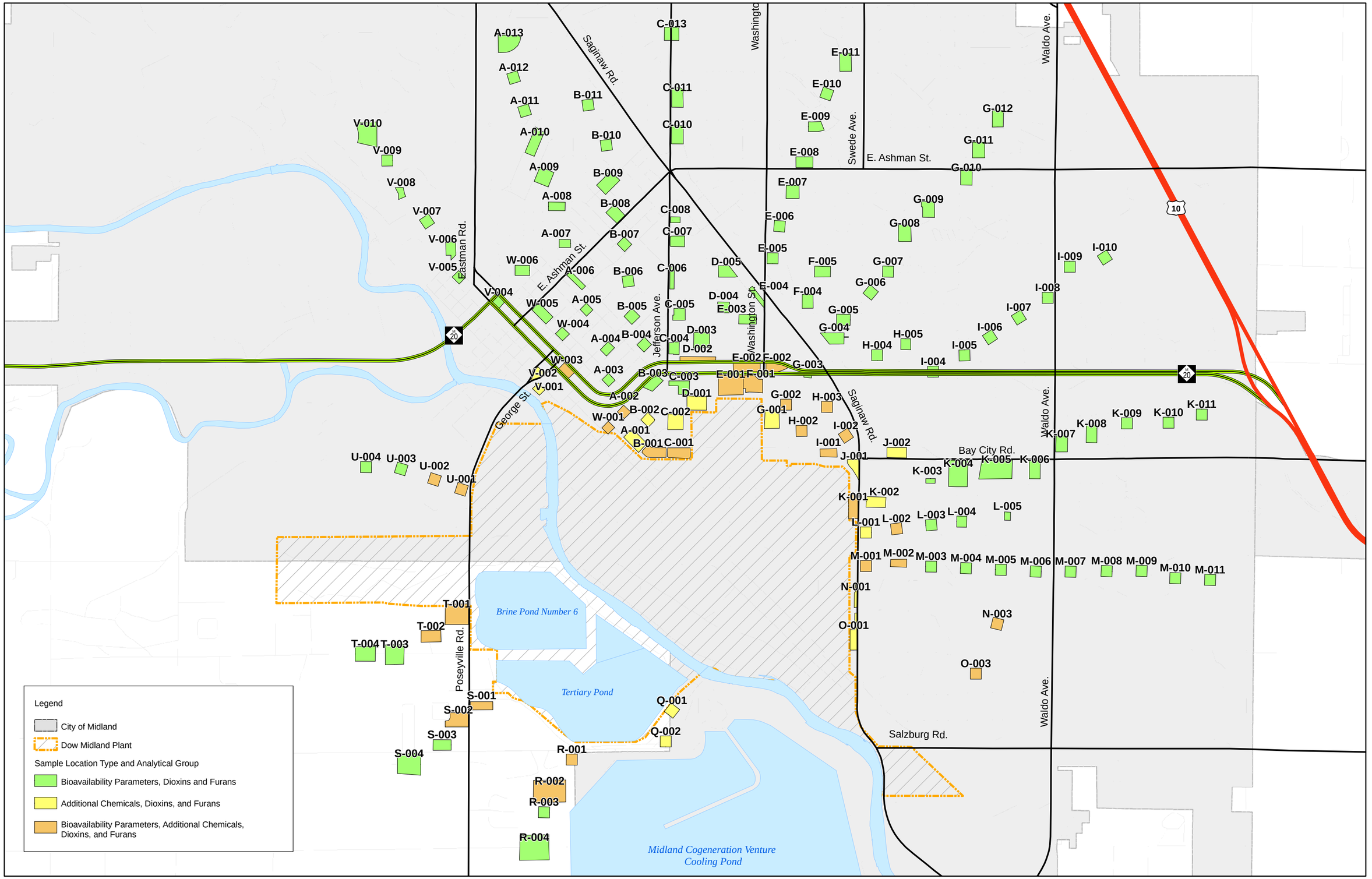

Figure 2-2
Proposed Soil Sampling Station Locations
Sampling and Analysis Plan in Support of Bioavailability Study

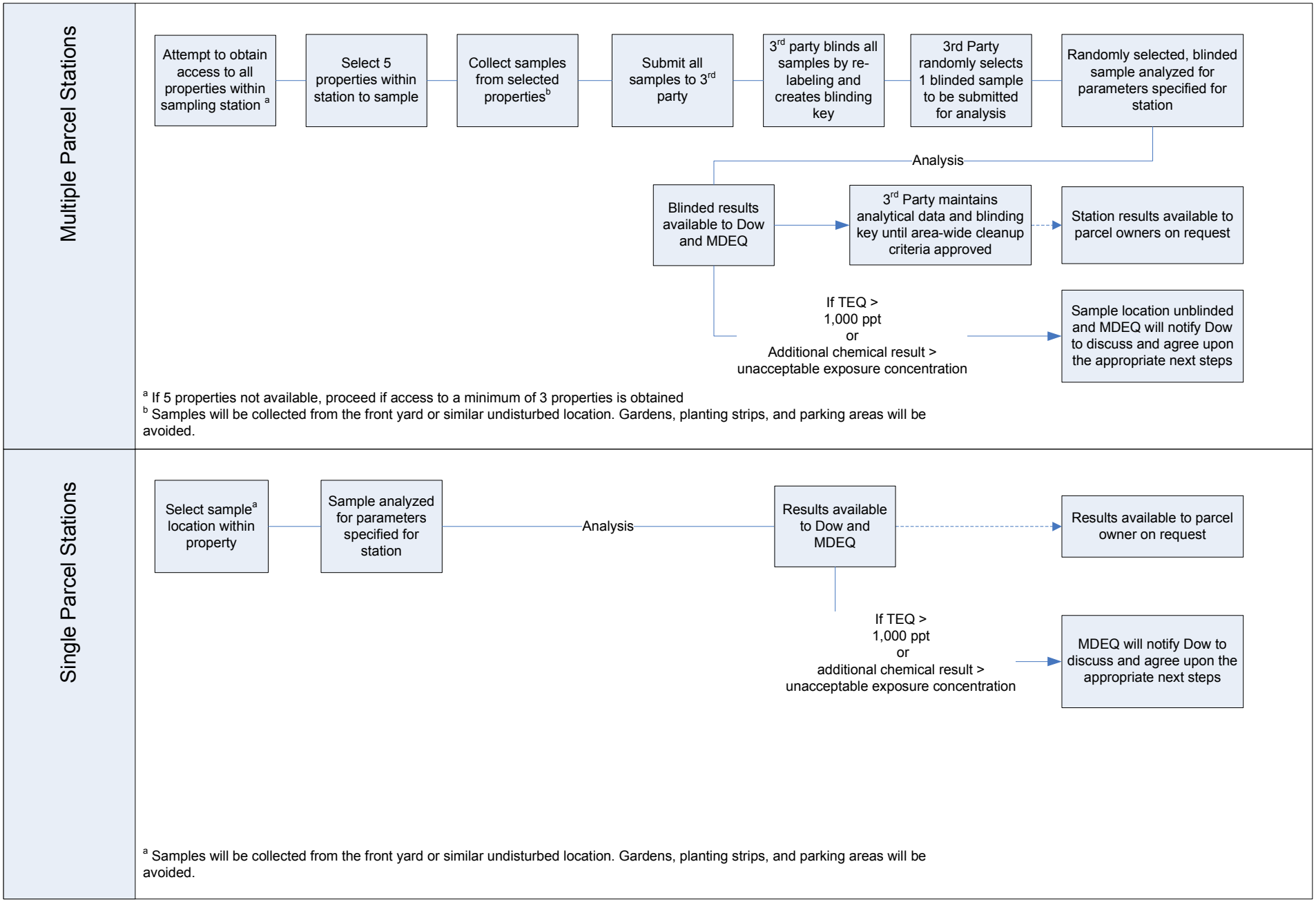

Figure 2-3
Sample Management Program
Sampling and Analysis Plan in Support of Bioavailability Study

SECTION 3

Data Evaluation Procedures

3.1 Bioavailability Parameter Results

The quantification of soil physical and geochemical properties potentially influencing bioavailability is intended to identify representative soils for use as feedstock in possible future bioavailability studies that will be used estimate relative bioavailability of dioxins and furans in study area soils.

Analytical results for the soil properties will be used to calculate best estimates of the ranges of values for each soil property. This analysis will also provide the basis for recommendations for colleting soils for use in future bioavailability studies that are representative of the soils observed within the study area. Meeting the sampling objectives will require both statistical and spatial evaluation of each of the soil properties as well as the concentrations of dioxins and furans in Midland area soils. Data evaluations will be limited to individual soil properties, consisting of the following procedures:

- Statistical distributions for each soil property of interest will be examined through graphical displays (probability plots of observed values against normal and lognormal theoretical values for the sample size). Conventional goodness-of-fit tests (Shapiro-Wilks and/or Shapiro-Francia tests for sample sizes less than and greater than 50 observations, respectively) to establish appropriate methods to estimate ranges of values for the soil properties within the study area will also be applied in the examination of soil properties of interest. Goodness-of-fit distribution test results will determine which equations are appropriate to provide statistical estimates of interest (ranges, median with confidence intervals, and/or upper bounds of soil property concentrations). If probability plots exhibit distinct breaks over the range of values, individual value-groupings will be plan-view mapped in conjunction with other spatial evaluations.

- Spatial distribution of the soil properties will be performed through plan-view mapping of results. Soil properties exhibiting apparent random distribution of values throughout the area will be considered homogeneous. Soil properties exhibiting localized clusters of elevated or reduced levels will be considered heterogeneous with potentially different subpopulations of concentration levels within the study area. Outputs from the evaluations will include summary statistics of each factor over the study area and the relative homogeneity of each factor and maps supporting application of single or multimodal estimates of factor concentrations. Soil properties exhibiting nonnormal behavior and/or spatially clustered results will be evaluated within spatially localized areas to provide more accurate estimates of concentrations within areas exhibiting localized distributions which differ in other areas.

- If one or more of the soil properties exhibit multimodal and/or spatially heterogeneous behavior, correlations among soil properties will be evaluated to determine which (if

any) soil properties coincide spatially. If soil properties covary and exhibit locally different levels of factor concentrations, populations within the study area will be identified as potentially independent areas for collection of soils for use in bioavailability studies.

- Because the nature of the distribution and relationships of the measures potentially affecting bioavailability is unknown at this time, it is not possible to determine precisely how these groupings will be developed. However, there are a number of multivariate methods that can be used to further generalize and characterize results. The preliminary univariate and spatial distributions of the bioavailability measures will be supplemented with multivariate methods to determine which measures covary and to what extent they covary. Cluster analyses can then be used to segregate different groups (across the multivariate sample space) to identify individual locations that are more and less similar. These groupings can then be mapped to determine if the groupings represent spatially distinct areas within the study area or suggest study-areawide heterogeneity.

The information on the statistical and spatial distribution of the study parameters will be used to group soils based on their characteristics for the purpose of selecting soils that will be used in a future bioavailability study. The following objectives will be used to guide selection of soils that will be collected for use in the bioavailability study.

- Test soils that are representative of the range of bioavailability parameters measured throughout the study area. Ideally, it is desired to select soils that are representative of low, medium, and high levels of the factors that may influence bioavailability.
- Test soils that are representative of dioxin/furan concentrations found throughout the study area. Soils selected for the bioavailability study should have dioxin/furan concentrations that are representative of the range concentrations that are present within the study area.

The final basis for the selection of soils to be used in the bioavailability study along with the methodology and procedures for collection of the samples will be documented in the future bioavailability work plan that will be submitted to MDEQ for review and approval. This information is not provided in this work plan because the basis for selection of the soils is not yet known.

3.2 Additional Hazardous Substances Results

Data resulting from this portion of the evaluation will provide preremedial investigation information on the presence or absence of a broad range of hazardous substances (chemicals) that may be associated with the Dow Plant. If all proposed samples are collected, the resulting sample set will consist of analytical results for both the 0- to 1-inch and 1- to 6-inch sample intervals at 40 locations proximal to the Dow Plant. This data set will be sufficient for the following:

- Evaluate the statistical distributions of analytes detected in each sample interval
- Evaluate the spatial distribution of detected analytes in each sample interval

- Determine whether the distributions of detected analytes in the different sample intervals are statistically similar

The results of these analyses are not intended to be used to conclude whether or not any chemical detected resulted from historic manufacturing operations at the Dow Plant, complete identification of Dow-related PCOIs, or provide detailed evaluation of potential risk.

The following subsections describe the evaluations that will be conducted.

3.2.1 Statistical Distributions

The initial summary of the analytical results from will rely upon descriptive statistics for each analyte and sample interval group. The statistical measures reported for each analyte will include the following:

- Number of samples
- Number of detected results
- Frequency of detections (ratio of detected results to total number of samples)
- Range of detected concentrations
- Range of reporting limits for nondetected results
- Standard summary statistics of mean, median, standard deviation, and coefficient of variation
- Preliminary point-interval estimate (for example, mean/median plus confidence intervals)

The statistical information will be presented in tables, which will be organized to clearly identify whether an analyte is present or absent in the designated sample interval.

3.2.2 Spatial Distribution

Plan-view mapping will be used to evaluate the spatial distribution of detected analytes.

3.2.3 Sample Interval Comparisons

Evaluations of both surface and subsurface soils, independently, will rely upon standard summary statistics, as described above. Comparison of the 40 paired surface (0- to 1-inch) and subsurface (1- to 6-inch) sets of results will consist of two steps. First, the pooled set of paired surface and shallow subsurface results will be summarized in the same way. Here, the summary tables will be used to establish which analytes can be reliably compared between the two sample depths. Reliability of comparisons depends, primarily, upon the frequency of detection. Three different cases and applicable evaluation methods are described, as follows:

1. The simplest case occurs for the analytes that are detected in all samples. Those analytes will be compared using conventional paired T-tests and/or the nonparametric analogue of the Mann-Whitney test comparing two populations. Results from the tests will be

summarized, listing the analytes for which no statistically significant differences in depths were detected, analytes that were significantly higher in surface samples, and analytes that were significantly lower in surface samples.

2. The second simple case, which precludes comparisons, consists of analytes for which detection frequencies are zero. Statistical comparisons between concentrations of an analyte detected at the two depths would be meaningless because any differences would simply represent differences in laboratory quantitation.

3. The more difficult case includes those analytes for which frequencies of detection lie between 0 and 100 percent. Analytes with extremely low frequencies of detection may be compared strictly on that basis: relative frequency of detection of a given analyte in surface and subsurface samples. Presumably, if there are statistically significant differences in detection frequency, the case would have been made that, to some extent, there are vertical differences in the distribution of the analyte—the substance of the difference can only be evaluated with improved detection limits.

Evaluation results will be summarized in as a list of analytes, grouped by case and statistical test result, defining the case and the presence/absence of statistically significant differences in analyte concentration [case 1] or analyte detection frequency [case 3] in surface and shallow subsurface soils.

3.3 Dioxin and Furan Results

Existing information on the concentration and distribution of dioxins and furans in the Midland area is limited. To supplement the existing data and begin to develop a better understanding of the distribution and concentrations of these chemicals, samples of surface soils collected and selected for analysis from all of the sampling stations will be analyzed for furans and dioxins. If access is granted by property owners for all sample areas, the investigation will yield results for over 145 locations within the study area. The data will provide useful information for an initial evaluation of both the statistical and relative spatial distribution of dioxin and furan concentrations in surface soils in the Midland area.

Data evaluations will be limited to statistical distribution testing and mapping of TEQ concentrations, similar to those evaluations described for bioavailability parameters and the additional target analyte chemicals. The results for 0- to 1-inch-interval samples will also be compared to results for 1- to 6-inch-interval samples to determine whether the two intervals are significantly different or can be treated as a single interval.

None of these evaluations require detailed property location or ownership information and can be conducted using the blinded sample identification numbers.

3.4 Effects of Access Constraints

Implementation of this study and the utility of the data obtained depend on success in gaining access to the proposed sample locations. For sample locations not on Dow-owned property, access agreements will be required from owners of public and private property. Dow will describe the confidential aspect of the study and indicate that the property owner

has the option of obtaining analytical results from their sampling station if a sample is collected from their property. Given the potential that access may be denied to a number of properties, Dow and MDEQ will review the access agreements obtained in the context of the sample design prior to initiating these field investigations.

The proposed sampling has been designed to obtain data that can be used to characterize soil properties with reasonable confidence over the study area and indicate the presence and level of dioxins and furans and other chemicals in Midland area soils. Once access efforts have been conducted and completed, potential limitations to the sampling design resulting from lack of access will be evaluated with respect to both number and location of properties giving access. Constraints on the number of locations granted access may adversely affect the statistical confidence in interpretation of results. Similarly, access constraints, limiting spatial coverage of the study area, could adversely affect the resulting information on the analytes of interest.

If either sample size or spatial distribution or the combination of sample size and distribution appears to severely limit attainment of project objectives, Dow will meet with MDEQ to discuss potential alternatives.

3.5 Data Gaps

Following the collection of data and subsequent analysis, it may be determined that data gaps exist that may need to be addressed prior to finalizing the bioavailability work plan. Any data gaps identified that affect the ability to select representative soils for use in the bioavailability study will be communicated to MDEQ prior to submission of the work plan in order to identify actions necessary to fill the data gaps. Actions that might be identified include: collecting additional samples or conducting additional or different laboratory analyses.

Samples collected to develop additional information on the nature and extent of dioxin and furans will be incorporated into the development of the remedial investigation work plan, and any data gaps identified will be incorporated into sampling proposed as part of that plan. Similarly, sampling to determine whether additional Dow-related hazardous substances are present in Midland area surface soil will be incorporated into the development of the remedial investigation work plan.

SECTION 4

Data Management and Validation

All data collected under this SAP will be managed in accordance with the QAPP (CH2M HILL, 2005c). However, most of the soil properties specified for this SAP are not standard chemical analyses and do not lend themselves to certain types of quality assurance specified in the QAPP (for example, matrix spikes and method blanks cannot be performed for particle size distribution or black carbon). All analytical results and laboratory reports will be reviewed for accuracy and validated where feasible. The data will then be accessible for evaluation, interpretation, and reporting activities.

SECTION 5

Schedule

Implementation of this SAP can be affected by weather and the time needed to obtain access to a sufficient number of properties. The schedule shown below has been constructed to identify the key dependencies and time frames.

Date	Action
June 1, 2006	Submit SAP to MDEQ for review and approval.
July 25, 2006	Submit revised SAP to MDEQ addressing MDEQ comments.
August 4, 2006	MDEQ review of SAP.
August 4, 2006	Upon MDEQ review of SAP, initiate mailing of access agreements for parcels within sampling stations
August 7, 2006	Submit approved SAP to Independent Science Advisory Panel (ISAP) for review.
September 1, 2006	ISAP provides comments on SAP.
September 1 to September 30, 2006	MDEQ review and approval. Finalize SAP and prepare to implement sampling program.
October 1 to November 15, 2006	Field sampling

There must be access to sufficient properties to achieve minimum investigation objectives and surface soils must be accessible (that is, no snow cover) for sampling be completed on this schedule.

The investigation report will be submitted to MDEQ within 60 days of completion of sampling, analytical work, data validation, data summary, and evaluation. The schedule above is predicated on a number of assumptions over which Dow has no control. Every effort has been made through meetings, conference calls, and electronic communications to prepare a SAP that will be approvable by MDEQ without modification. Based on input from MDEQ, it was assumed that the Independent Science Advisory Panel (ISAP) review would be limited to the verification that the appropriate bioavailability parameters were selected. Review comments from ISAP were assumed to be provided within 30 days.

SECTION 6

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